

INCH-POUND

MIL-C-70845A (AR)

16 August 1994

SUPERSEDING

MIL-C-70845 (AR)

25 July 1989

MILITARY SPECIFICATION

CARTRIDGE, 9MM, PRACTICE, TRACER, M939

This specification is approved for use by the U.S. Army Armament, Munitions and Chemical Command, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the requirements, examinations and tests for the M939 9mm, Tracer, Practice Cartridge (see 6.1).

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document, should be addressed to: Commander, U.S. Army ARDEC, ATTN: SMCAR-BAC-S, Picatinny Arsenal, New Jersey 07806-5000 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 1305

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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SPECIFICATIONS

MILITARY

- MIL-A-2550 - Ammunition, General Specification for
- MIL-A-48078 - Ammunition, Standard Quality Assurance Provisions, General Specification for

STANDARDS

FEDERAL

- FED-STD-313 - Material Safety Data Sheets, Preparation and Submission of

MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes
- MIL-STD-109 - Quality Assurance Terms and Definitions
- MIL-STD-636 - Visual Inspection Standards for Small Arms Ammunition through Caliber .50
- MIL-STD-644 - Visual Inspection Standards and Inspection Procedures for Inspection of Packing, Packaging and Marking of Small Arms Ammunition
- MIL-STD-650 - Explosives: Sampling, Inspection and Testing
- MIL-STD-810 - Environmental Test Methods for Aerospace and Ground Equipment
- MIL-STD-1168 - Lot Numbering of Ammunition
- DOD-STD-1468 - Small Caliber Ammunition Test Procedures 9mm Cartridges
- MIL-STD-1751 - Safety and Performance Test for Qualification of Explosive
- MIL-STD-1904 - Design and Test Requirements for Level A Packaging

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the DODSSP - Customer Service, Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

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DRAWINGS (see 6.10)

U.S. ARMY ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING
CENTER (ARDEC)

7643674	- Classification of Cartridge Case Defects for Small Arms Ammunition
12913886	- Cartridge, 9mm, Practice, Tracer, M939
LI12913886	- Inspection Equipment Lists for Cartridge, 9mm, Practice, Tracer, M939
12913959	- Packaging and Marking, Cartridge, 9mm, Practice, Tracer, M939, Box, Wirebound
12913960	- Packaging and Marking, Cartridge, 9mm, Practice, Tracer, M939, Box, M2A2
12913962	- Packaging and Marking, Cartridge, 9mm, Practice, Tracer, M939, Carton

PUBLICATIONS

DEPARTMENT OF DEFENSE

TB 700-2	- Department of Defense Explosive Hazard Classification Procedures
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DEPARTMENT OF INTERIOR

Bureau of Mines Report S624	- Laboratory Equipment and Test Procedures for Evaluating Explosibility
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(Copies of other Government documents, drawings, and publications required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained. (See contract provisions for additional precedence criteria.)

3. REQUIREMENTS

3.1 General. The cartridges shall comply with the requirements shown on drawing 12913886, MIL-A-2550, all other applicable specifications and the requirements stated in this section. All of the cartridge components shall be compatible

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with each other. The primer mix and pyrotechnic mix shall be non-corrosive and the propellant shall be smokeless. The cartridge shall be compatible with the sub-caliber barrel and bolt assembly of the M287 Sub-Caliber Trainer for the AT4 Weapons System.

3.2 First article inspection. When specified in the contract or purchase order (see 6.2), a sample shall be subjected to first article inspection in accordance with the technical provisions herein (see 4.3).

3.3 Performance characteristics.

3.3.1 Primer sensitivity. The energy imparted by a 55 ± 0.5 gram steel ball falling 12.0 inches shall initiate all primers. The energy imparted by a 55 ± 0.5 gram steel ball falling three inches shall not cause initiation of the primer.

3.3.2 Residual stress. The cartridge shall not split when subjected to the accelerated stress test for the applicable materials.

3.3.3 Bullet extraction. The average force required to separate the bullet from the cartridge case shall be not less than 40 pounds. The separation force for any individual cartridge shall not be less than 35 pounds.

3.3.4 Waterproof (bubble test). The cartridge shall release not more than one bubble of air when tested at a pressure of two (2) pounds per square inch (psi) below atmospheric pressure for thirty (30) seconds.

3.3.5 Chamber pressure. (EPVAT barrel) The corrected average peak chamber pressure of the cartridge conditioned at 21°C and measured with a piezoelectric gauge at the mid case position shall not exceed 159 Megapascals (MPa) (23,000 psi). No individual peak pressure shall exceed 190 MPa (27,550 psi). When conditioned and fired at the following temperatures, no individual peak chamber pressure shall exceed 190 MPa (27,550 psi).

$-18^{\circ}\text{C} \pm 2^{\circ}\text{C}$
 $60^{\circ}\text{C} \pm 2^{\circ}\text{C}$

3.3.6 Dispersion. (M287 barrel) The average linear standard deviation, both horizontal and vertical, for all ten round targets fired at a range of 100 meters shall not exceed 4.3 inches.

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3.3.6.1 Alternate dispersion requirement. (M287 barrel)
The average linear standard deviation, both horizontal and vertical, for all ten round targets fired at a range of 100 yards shall not exceed 3.9 inches.

3.3.7 Function and casualty. (M287 barrel) The cartridge shall safely function in the M287 sub-caliber training weapon without casualty in the temperature range of -18°C to 60°C.

3.3.8 Trajectory. (M287 barrel) The trajectory of the projectile shall match, within ± 1.8 mil, the trajectory of the AT4 tactical round, M136, at all ranges out to 300 meters. The firing table for the AT4 round is given in Table I. The design velocity requirement established prior to first article testing (see 3.3.9.1) shall be used to verify trajectory match for production ammunition.

TABLE I. AT4 firing table for standard conditions.

Range (Meters)	Time of Flight (Seconds)	Maximum Ordnate (Meters)	Range to Maximum Ordnate (Meters)
0	0.0	0.0	0
50	0.2	0.0	25
100	0.4	0.2	51
150	0.5	0.4	77
200	0.7	0.7	103
250	1.0	1.1	130
300	1.2	1.7	157
350	1.4	2.5	185
400	1.7	3.4	212
450	1.9	4.5	241
500	2.2	5.8	269

3.3.9 Velocity. The following velocity requirements apply.

3.3.9.1 Design velocity. (M287 barrel) Prior to First Article Testing, the contractor will submit a 200-round sample to the Government for EPVAT and trajectory testing. Based on these results, the Government will define a design velocity to be measured 16 meters from the muzzle of a M287 barrel for cartridges fired at $21 \pm 2^\circ\text{C}$. This value will be established as the requirement for all subsequent production for the purpose of determining compliance with the trajectory requirement (see 6.8).

3.3.9.2 Velocity for trajectory control. (M287 barrel) The mean velocity of cartridges conditioned at $21 \pm 2^\circ\text{C}$, measured 16 meters from the muzzle, fired from the M287 Sub-Caliber Trainer shall not vary from the design velocity by more than ± 45 feet per second (fps).

3.3.9.3 Velocity at extreme temperatures. (EPVAT barrel) When conditioned and fired at the following temperatures, the average velocity at each temperature shall not vary by more than ± 98 fps from the average velocity obtained at 21°C :

$-18 \pm 2^\circ\text{C}$
 $+60 \pm 2^\circ\text{C}$

3.3.9.4 Velocity standard deviation. (M287 barrel) The mean velocity of the test cartridges plus or minus 2 standard deviations (as determined in 3.3.9.2) shall not vary from the design velocity established in 3.3.9.1 by more than plus or minus 105 ft/sec.

3.3.10 Trace. (M287 barrel) The tracer shall ignite and trace with full luminosity to a range of at least 450 meters. The trace when observed from the firer's position, shall be visible both day and night.

3.3.11 Bullet integrity. (M287 barrel) The bullet of the cartridge shall not burst or fragment in the barrel or during its effective range when fired.

3.4 Corrosion. (M287 barrel) The cartridge shall safely function in the M287 Trainer after being subjected to a 5 percent salt spray.

3.5 Safety.

3.5.1 Noise. (M287 barrel) The blast overpressure (noise) produced by the cartridge at the gunner's head position shall not exceed 160 decibels.

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3.5.2 Maximum range. (M287 barrel) The maximum range of the cartridge's bullet shall be 1800 meters at standard atmospheric conditions.

3.5.3 Secure cargo (transportation/vibration). After being subjected to the secure cargo (transportation/vibration) test, the test cartridge shall be safe to store, handle and fire and the container shall be functional and suitable for its intended purpose.

3.5.4 Sequential rough handling. After the packaged cartridges are sequentially subjected to a 3-foot drop test, a loose cargo test and a 7-foot drop test, and bare cartridges are subjected to a 5-foot drop test, the container shall be functional and suitable for its intended function and the cartridges shall be safe to store, handle and fire. After packaged cartridges are subjected to a 40-foot drop test, the cartridges shall not detonate, deflagrate or exhibit propellant spillage and shall be safe to handle and dispose of.

3.5.5 Explosive sensitivity. Explosive sensitivity data shall be generated as specified in 4.5.18 for every explosive material in the cartridge (see 6.5).

3.5.6 Final hazard classification. The cartridge in its shipping and storage package shall meet the following final hazard classification:

DoD Hazard Class:	1.4
DoD Storage Compatibility Group:	C
DOT Hazard Class:	Class C Explosive
DOT Container Marking:	Small Arm Ammunition

3.5.7 Material safety sheets. A material safety data statement in accordance with FED-STD-313 shall be prepared for every hazardous material in the cartridge (se 6.4).

3.6 Workmanship. The requirements for workmanship are as specified on the applicable drawings, referenced specifications and the following:

3.6.1 Metal defects. The cartridge shall be free of folds, wrinkles, deep draw scratches, scaley metal, dents and other defects.

3.6.2 Foreign matter. The cartridge shall be free of corrosion, stains, discoloration, dirt, oil and smears of lacquer.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of Sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.1.2 General provisions. Unless otherwise specified herein, the provisions of MIL-A-48078 apply and form a part of this specification. Reference shall be made to MIL-STD-109 to define quality assurance terms used herein.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.3).
- b. Quality conformance inspection (see 4.4).

4.3 First article inspection.

4.3.1 First article sample. The contractor shall submit a first article sample of 15,000 cartridges as designated by the Contracting Officer for evaluation in accordance with the provisions of 4.3.2. The first article sample shall be of the same design as will be submitted for normal production. It shall be manufactured using the same materials and process as will be

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used in normal production. Equipment utilized to manufacture the first article sample shall embody the process techniques to be used in normal production. The first article sample shall not be custom made in such a way that causes the product quality to be different than that which can be expected in normal production.

4.3.1.1 Design velocity determination before first article. Prior to submission of the first article sample, the contractor is required to submit a 200-round sample to the Government so that the Government may determine the design velocity requirement to be applied to first article and subsequent production. This sample shall represent the same design as will be submitted for first article and production.

4.3.2 Inspections to be performed. See MIL-A-48078 and Table II.

4.3.3 Rejection. See MIL-A-48078.

4.3.4 Examination for defects. Examination for critical, major and minor defects shall be performed on a class basis. The sample to be examined shall be drawn in such a way that it is representative of the entire quantity submitted. Non-conforming cartridges shall be rejected and put aside for further examination. Disposition instructions for non-conforming cartridges shall be provided by the contracting officer.

TABLE II. First article inspection.

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CLASSIFICATION OF CHARACTERISTICS

PARAGRAPH	TITLE	SHEET 1 OF 2		DRAWING NUMBER
	Cartridge, 9mm Tracer, M939			NEXT HIGHER ASSEMBLY
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
	Examination for defects	800	3.1	4.4.3.1
	Critical class	800-0-1		
	Major class	800-2-3		
	Minor class	800-10-11		
	Primer sensitivity	2/ 1/	3.3.1	4.5.1
	Residual stress	50 1/	3.3.2	4.5.2
	Bullet extraction	50 1/	3.3.3	4.5.3
	Waterproof	50-13-14	3.3.4	4.5.4
	Pressure and velocity		3.3.5 &	4.5.5
			3.3.9.3	
	+21 deg C	120 1/		
	-18 deg C	120 1/		
	+60 deg C	120 1/		
	Velocity for trajectory control	300 1/ 3/ 4/	3.3.9.1, 4.5.18	
			3.3.9.2&	
			3.3.9.4	
	Dispersion	300 1/	3.3.6	4.5.6
	Function and casualty		3.3.7	4.5.7
	+21 deg C	300-Table III		
	-18 deg C	300-Table III		
	+60 deg C	300-Table III		
	Trace	100-20-21	3.3.10	4.5.8

NOTES:

- 1/ Failure of the cartridges to comply with the applicable requirement shall be cause for rejection of the first article.
- 2/ See 4.4.4.2, Note 2.
- 3/ May be performed concurrently with Dispersion.
- 4/ Test quantity divided equally among three barrels.

TABLE II. First article inspection.

CLASSIFICATION OF CHARACTERISTICS

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PARAGRAPH	TITLE	SHEET 2 OF 2		DRAWING NUMBER
	Cartridge, 9mm Tracer, M939			NEXT HIGHER ASSEMBLY
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
	Bullet integrity Corrosion Noise Maximum range Secure cargo Sequential rough handling Explosive sensitivity Final hazard classification	(150) 3/ 1/ 50 2/ 10 1/ 4/ 1/ 4000 1/ 5/ 1/ - 8000	3.3.11 3.4 3.5.1 3.5.2 3.5.3 3.5.4 3.5.5 3.5.6	4.5.9 4.5.10 4.5.11 4.5.12 4.5.13 4.5.14 4.5.15 4.5.16
NOTES: 1/ Failure of the cartridges to comply with the applicable requirement shall be cause for rejection of the first article. 2/ Failure of the rounds to safely function (in accordance with Table III) after the corrosion test shall be cause for rejection. 3/ Perform concurrently with function and casualty testing. 4/ Perform concurrently with trajectory testing. 5/ Utilize samples from secure cargo testing.				

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TABLE III. Firing defects.

Defects	Acceptance Percentages
a. Misfire	0.00
b. Bullet remaining in bore <u>1/</u>	0.00
c. Perforation in firing pin indent in primer cup	1.00
d. Escape of gas around primer cup (1) more than 50 percent of periphery (2) less than 50 percent of periphery	0.50 1.00
e. Blown primer <u>2/</u>	0.00
f. Loose primer which falls out of pocket	0.00
g. Loose primer which does not fall out of pocket	0.50
h. Case split (longitudinal) (1) Mouth (defined as the length of bullet intrusion) (2) Body (3) Through the head	2.00 0.20 0.00
i. Case rupture (circumferential) (1) Partial rupture (2) Complete rupture	0.20 0.00
j. Stoppage applicable solely to ammunition	0.00
k. Bullet stripping	0.00
l. Other defects (each kind)	0.20
m. Total of all defects	3.50

1/ No retest permitted.

2/ Primer not in pocket after firing and both head of cartridge case and pocket enlarged and distorted.

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4.4 Quality conformance inspection.

4.4.1 Lot formation. In accordance with MIL-A-48078.

4.4.1.1 Component parts. Unless otherwise specified, component parts shall be homogeneous and of a lot size convenient to the contractor and inspected, tested and accepted by the contractor. The cartridge lot shall contain:

- a. Cartridge cases from one interfix.
- b. Bullet from one interfix.
- c. Primer from one interfix and not more than 2 lots.
- d. Propellant from one interfix and not more than 2 lots.

4.4.1.2 Lot identification. Each lot of ammunition shall be identified as to type, caliber and model, as well as a lot number in accordance with MIL-STD-1168.

4.4.2 Rejection. Failure of the cartridges to conform with the applicable requirements shall be cause for rejection of the lot.

4.4.3 Examination. Examination for defects shall be performed in accordance with 4.4.3.1.

- a. Major and minor defects. Attributes sampling inspection (ASI) for major and minor defects shall be performed on a class basis in accordance with MIL-STD-105, Inspection Level II. All non-conforming cartridges shall be rejected. See 6.7 for guidance concerning use of sampling tables.
- b. Critical defects. Unless otherwise specified, one hundred percent examination shall be performed for all critical defects. If a visual critical defect is found in a sample either just prior to a firing test or after a firing test (and the defect is not due to the firing), the lot shall be rejected.

QUALITY CONFORMANCE INSPECTION

CLASSIFICATION OF CHARACTERISTICS

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PARAGRAPH	TITLE	SHEET 1 OF 3		DRAWING NUMBER
4.4.3.1	Cartridge, 9mm, Tracer, M939			NEXT HIGHER ASSEMBLY
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
CRITICAL				
1.	Split case in K, L or M location (see Dwg. 7643674)	100%	3.1	1/ Visual
2.	Perforated case	100%	3.1	Visual
MAJOR				
101.	Cartridge, corroded or stained, if etched	2/	3.1	Visual
102.	Case, round head			
103.	Split case in I or J location (see Dwg. 7643674)		3.1	Visual
104.	Case, beveled underside of head		3.1	Visual
105.	No chamfer on head (rim)		3.1	Visual
106.	Split bullet jacket		3.1	Visual
107.	Loose bullet		3.1	Visual
108.	Loose primer		3.1	Visual
109.	Total length of cartridge, incorrect		3.1	Gage

NOTES:

- 1/ Refer to MIL-STD-636 for visual defects. In the event of conflict between paragraphs of this specification and MIL-STD-636 as to defect classification, the classification specified herein shall apply.
- 2/ See 6.7.

CLASSIFICATION OF CHARACTERISTICS

PARAGRAPH	TITLE	SHEET 2 OF 3		DRAWING NUMBER
4.4.3.1	Cartridge, 9mm, Tracer, M939			NEXT HIGHER ASSEMBLY
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
110.	Cartridge profile failure (requiring more than 20 pounds dead weight to insert in the profile and alignment gage)		1/	
111.	Diameter of extractor groove, incorrect		3.1	Gage
112.	Diameter of head, incorrect		3.1	Gage
113.	Thickness of head, incorrect		3.1	Gage
114.	Depth of primer, incorrect		3.1	Gage
115.	Case length, incorrect		3.1	Gage
116.	No primer		3.1	Visual
117.	Cocked primer		3.1	Visual
118.	Inverted primer		3.1	Visual
MINOR		2/		
201.	Cartridge, discolored, dirty, oily smeared		3.1	Visual
202.	Case dent		3.1	Visual
203.	Case draw scratch		3.1	Visual
204.	Case scratch		3.1	Visual
205.	Case scaly metal		3.1	Visual

NOTES:

- 1/ Refer to MIL-STD-636 for visual defects. In the event of conflict between paragraphs of this specification and MIL-STD-636 as to defect classification, the classification specified herein shall apply.
- 2/ See 6.7.

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CLASSIFICATION OF CHARACTERISTICS

PARAGRAPH	TITLE	SHEET 3 OF 3		DRAWING NUMBER
4.4.3.1	Cartridge, 9mm, Tracer, M939			NEXT HIGHER ASSEMBLY
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
206.	Case wrinkle		3.1	1/ Visual
207.	Case buckle		3.1	Visual
208.	Case bulge		3.1	Visual
209.	Illegible or missing head stamp		3.1	Visual
210.	Defective head		3.1	Visual
211.	Defective mouth		3.1	Visual
212.	Bullet dent		3.1	Visual
213.	Bullet scratch		3.1	Visual
214.	Scaly metal (bullet)		3.1	Visual
215.	Upset (crooked) point (bullet)		3.1	Visual
216.	Nicked or dented primer		3.1	Visual
217.	No waterproofing material (primer pocket joint)		3.1	Visual
218.	Workmanship		3.1 3.6	Visual Visual

NOTES:

- 1/ Refer to MIL-STD-636 for visual defects. In the event of conflict between paragraphs of this specification and MIL-STD-636 as to defect classification, the classification specified herein shall apply.
- 2/ See 6.7.

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4.4.4 Tests. Testing as specified in 4.4.4.2 shall be performed in accordance with the methods specified in 4.5.

4.4.4.1 Test samples. Only cartridges having met the visual and dimensional requirements shall be used in the ballistic tests, and shall have been selected in such a manner that the sample is representative of the entire lot. The cartridges shall be thoroughly mixed before being divided into samples for the various tests.

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CLASSIFICATION OF CHARACTERISTICS

PARAGRAPH	TITLE	SHEET 1 OF 2		DRAWING NUMBER
4.4.4.2	Cartridge, 9mm, Tracer, M939			NEXT HIGHER ASSEMBLY
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
	Primer sensitivity	2/ 1/	3.3.1	4.5.1
	Residual stress	50 1/	3.3.2	4.5.2
	Bullet extraction	20-1-2	3.3.3	4.5.3
	Waterproof	20-5-6	3.3.4	4.5.4
	Pressure and velocity		3.3.5 &	4.5.5
	+21 deg C	30 1/	3.3.9.3	
	-18 deg C	30 1/		
	+60 deg C	30 1/		
	Velocity for trajectory control 3/ 4/	30 1/	3.3.9.1, 4.5.18	
	Dispersion 4/			
	Function and casualty 5/			
	+21 deg C	30 1/	3.3.9.2&	4.5.6
	-18 deg C		3.3.9.4	4.5.7
	+60 deg C		3.3.6	
	Trace		3.3.7	
		150-Table III		
		150-Table III		
		150-Table III		
		50-10-11	3.3.10	4.5.8

NOTES:

- 1/ Failure of the cartridges to comply with the applicable requirement shall be cause for rejection of the lot, subject to testing of a second sample consisting of double the quantity of cartridges used in the first test. Failure of the cartridges in the second sample to comply with the applicable requirement shall be cause for rejection of the lot.
- 2/ This test shall be performed prior to all other tests cited in 4.4.4.2. Test sample shall consist of the number of cartridges required to perform a complete run-down test wherein 50 primers are tested at each height. If the average critical height (H) plus (Notes continued on next page)

QUALITY CONFORMANCE INSPECTION

CLASSIFICATION OF CHARACTERISTICS

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PARAGRAPH	TITLE	SHEET 2 OF 2		DRAWING NUMBER
4.4.4.2	Cartridge, 9mm, Tracer, M939			NEXT HIGHER ASSEMBLY
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE

NOTES:

- 2/ (Con't) three standard deviations (3 sigma) exceeds the all fire requirement or if the average critical height minus two standard deviations (2 sigma) is less than the no fire requirement, the lot shall be rejected, subject to performance of a second complete run-down test wherein 100 primers are tested at each height. Failure of the second sample to comply with the above criteria shall be cause for rejection of the lot.
- 3/ May be performed concurrently with dispersion.
- 4/ Test quantity divided equally among three barrels.
- 5/ Function and casualty defects shall not exceed the acceptance percentages specified in Table III. Failure of the cartridges to comply with the function and casualty requirements shall be cause for rejection of the lot, subject to the testing of a second sample consisting of double the quantity of cartridges used in the first sample. For those defects for which the allowable acceptance percentage in Table III is 0.00, the occurrence of a defect of this type in the second sample shall be cause for rejection of the lot. For those defects for which the allowable acceptance percentage in Table III is greater than 0.00, failure of the cartridges in the combined first and second sample to comply with the requirements of Table III shall be cause for rejection of the lot.

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4.4.5 Packaging, packing and marking. Inspection for packaging, packing and marking shall be in accordance with MIL-STD-644. During or immediately prior to packaging operation, 100 percent examination of the cartridge shall be performed to ascertain that the cartridge type conforms to the drawing. Occurrence of any incorrect type cartridges shall be classed as a major defect. All non-conforming cartridges shall be rejected.

4.4.6 Inspection equipment. The contractor shall submit for approval inspection equipment designs in accordance with the terms of the contract. See LI12913886, Section 6 of MIL-A-48078 and 6.3 herein.

4.5 Methods of inspection. All firings in the trainer system shall be performed utilizing a Government-approved firing fixture. Type AA, 40-pound Kraft, Type I wrapping paper (minimum, 1 meter x 1 meter) shall be utilized where witness screens are specified.

4.5.1 Primer sensitivity. The test shall be conducted in accordance with DOD-STD-1468, Section 9.

4.5.2 Residual stress.

4.5.2.1 Cartridge with brass cases. The test shall be conducted in accordance with DOD-STD-1468, Section 7.

4.5.2.2 Cartridges with polyethylene cases. Test shall be conducted in accordance with Appendix A.

4.5.2.3 Cartridges with steel cases. Test not required.

4.5.2.4 Cartridges with aluminum cases. The corrosion test specified in 4.5.12 shall be utilized as the residual stress test for aluminum cases.

4.5.2.5 Cartridges with cases of other materials. The test shall be conducted in accordance with procedures approved by the Government appropriate to the material(s) used to manufacture the cartridge.

4.5.3 Bullet extraction. The cartridge shall be tested by the Government-approved bullet extraction machine in accordance with DOD-STD-1468, Section 5.

4.5.4 Waterproof. The test shall be conducted in accordance with DOD-STD-1168, Section 8, Procedure II.

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4.5.5 Chamber pressure and velocity. The test sample shall be conditioned at $20^{\circ}\text{C} \pm 2^{\circ}\text{C}$, $-18^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and $60^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for at least two (2) hours. The test shall be conducted in accordance with DOD-STD-1468, Sections 4 and 12, except action time need not be measured.

4.5.6 Dispersion. The test shall be conducted in accordance with Appendix B.

4.5.7 Function and casualty. The test shall be conducted in accordance with DOD-STD-1468, Section 6, with the following amendments:

- a. The total quantity of rounds fired shall be as specified in Table II in 4.4.4.2.
- b. Two M287 Trainer Systems shall be used, with one half the total rounds to be fired in each Trainer System.
- c. Test cartridges shall be chambered one by one and fired only in single shots in uniform interval.
- d. The Trainer Systems shall be fired only in horizontal position.
- e. The barrels shall be air or water cooled after every 100-round firing.

4.5.8 Trace. The test shall be conducted in accordance with Appendix C.

4.5.9 Bullet integrity. The test shall be conducted during function and casualty testing (see 4.5.7). Fifty (50) rounds shall be fired at each temperature (20°C , -18°C and 60°C). A paper sheet (6 feet x 6 feet, minimum) shall be stretched tightly over a rigid frame of the same size. The sheet shall be placed perpendicular to the barrel of the weapon, 15 feet from the muzzle. The sheet shall be replaced as necessary to facilitate observation. Any evidence of bullet fragmentation indicated by irregular perforations or by the number of perforations exceeding the number of rounds fired shall be noted. All irregular perforations shall be measured. All irregular perforations greater than 1/10 inch shall be classed as defects.

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4.5.10 Corrosion. The sample shall be subjected to the salt-fog test outlined in Method 509 of MIL-STD-810. After 24 hours of exposure to the 5 percent mixture, the sample shall be examined and its condition documented. The round shall then be chambered and fired in the M287 Trainer. Any defects specified in Table III for which the acceptance percentage criteria is 0.00 shall be recorded.

4.5.11 Noise. The test shall be conducted in accordance with Appendix D.

4.5.12 Maximum range. Testing shall be performed by the Government concurrently with trajectory testing.

4.5.13 Secure cargo (transportation/vibration). Two wire-bound boxes (4000 rounds total) shall be subjected to the secured, non-tactical vibration test as specified in paragraph 6.3.1 of MIL-STD-1904. Testing shall be performed at ambient temperature only. Following testing, failure of the containers to comply with the criteria specified in paragraph 7.4 of MIL-STD-1904 shall be cause for rejection. The containers shall be unpacked and the cartridges visually examined for damage. Failure of the cartridges to comply with the criteria specified in paragraph 7.3 of MIL-STD-1904 shall be cause for rejection. All damage to containers and cartridges shall be recorded. The cartridges shall be repacked and subjected to the sequential rough handling test. The secure cargo test shall be performed by the Government.

4.5.14 Sequential rough handling. This test shall be performed after the secure cargo test utilizing the same cartridges and packaging. One wire-bound box (2000 rounds) shall be conditioned at a temperature of $160 \pm 5^{\circ}\text{F}$ and the second box shall be conditioned at $-65 \pm 5^{\circ}\text{F}$. After conditioning for a minimum of 16 hours, both boxes shall be subjected to the following tests in the order specified:

- a. Three-foot drop test in accordance with paragraph 6.4 of MIL-STD-1904.
- b. Loose cargo test in accordance with paragraph 6.13 of MIL-STD-1904 (two planes).
- c. Seven-foot drop test in accordance with paragraph 6.4 of MIL-STD-1904, with the exception that each box shall be dropped twice, once on the bottom and once on the box side.

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At the conclusion of the testing, failure of the containers to comply with the criteria specified in paragraph 7.4 of MIL-STD-1904 shall be cause for rejection. The containers shall be unpacked and the cartridges visually examined for damage. Failure of the cartridges to comply with the criteria specified in paragraph 7.3 of MIL-STD-1904 shall be cause for rejection. All damage to containers and cartridges shall be recorded. A random sample of 150 cartridges shall be selected from each of the two wire-bound boxes (300 rounds total). A sample of 50 cartridges from the 300-round sample shall be subjected to the following 5-foot drop test.

Each of the fifty rounds shall be dropped twice on the same surface utilized in the 7-foot drop test from a height of 5 feet \pm 3 inches in the orientations specified below:

<u>Drop Orientation</u>		
<u>Round No.</u>	<u>Drop No. 1</u>	<u>Drop No. 2</u>
1 & 2	Horizontal	Horizontal
3 & 4	Horizontal	Base down
5 & 6	Horizontal	Nose down
7 & 8	Horizontal	45°, base down
9 & 10	Horizontal	45°, nose down
11 & 12	Base down	Horizontal
13 & 14	Base down	Base down
15 & 16	Base down	Nose down
17 & 18	Base down	45°, base down
19 & 20	Base down	45°, nose down
21 & 22	Nose down	Horizontal
23 & 24	Nose down	Base down
25 & 26	Nose down	Nose down
27 & 28	Nose down	45°, base down
29 & 30	Nose down	45°, nose down
31 & 32	45°, base down	Horizontal
33 & 34	45°, base down	Base down

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<u>Drop Orientation</u>		
<u>Round No.</u>	<u>Drop No. 1</u>	<u>Drop No. 2</u>
35 & 36	45°, base down	Nose down
37 & 38	45°, base down	45°, base down
39 & 40	45°, base down	45°, nose down
41 & 42	45°, nose down	Horizontal
43 & 44	45°, nose down	Base down
45 & 46	45°, base down	Nose down
47 & 48	45°, base down	45°, base down
49 & 50	45°, base down	45°, nose down

At the conclusion of the drop testing, the 50-round sample shall be combined with the remaining 250 rounds of the original sample and shall be fired at ambient temperature in accordance with the procedures for function and casualty testing specified in 4.5.7. The reliability (total number of defects/total number of rounds fired) demonstrated in this test shall be no more than 10 percent below the reliability demonstrated during the initial ambient temperature function and casualty test. The remaining metal container from each box shall be repacked and combined into one wire-bound box (the one in best condition) and shall be subjected to a 40-foot drop test at ambient temperature in accordance with paragraph 6.12 of MIL-STD-1904. Following this test the cartridges shall be safe to handle and dispose of as specified in 3.5.5. The container need not be functional. The test results shall be documented in accordance with paragraph 5.3 of MIL-STD-1904 and be supplemented with photographs documenting the procedures and damages. The sequential rough handling test shall be performed by the Government.

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4.5.15 Explosive sensitivity. The ARDEC Safety Office shall determine which materials utilized in the cartridge require sensitivity evaluation testing by the Government, if required. The sensitivity tests required shall be as follows:

<u>Test</u>	<u>Test Document</u>	<u>Test Procedure/ Paragraph or Description</u>
a. Friction Test - (apparatus and comparison values)	MIL-STD-1751	5.4.8 or 5.5.3
b. Impact Test - (apparatus and comparison values)	MIL-STD-1751 TB 700-2	5.2.2, 5.4.2 or 5.5.1 5.2.i
c. Electrostatic sensitivity - (apparatus and comparison values)	MIL-STD-1751	5.2.3, 5.4.7 or 5.5.4
d. Auto ignition temperature	MIL-STD-1751	5.3.9
e. Explosive temperature (5 sec)	MIL-STD-650	506.1
f. Detonation test	TB 700-2	5.2.f
g. Ignition and unconfined burning test	TB 700-2	5.2.g
h. Thermal stability test	TB 700-2	5.2.h
i. Card gap test	TB 700-2	5.2.j
j. Explosibility of dusts	BOM Rpt S624 Page 12	Minimum Explosive Concentration

4.5.16 Final hazard classification. Final hazard classification tests shall be performed in accordance with TB 700-2, paragraph 5.3. The Government reserves the right to observe all final hazard classification tests (see 6.6). The following shall be recorded:

- a. Nomenclature and top drawing of the item.
- b. Packaging description of the item and packaging drawings.

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c. Test data in accordance with TB 700-2.

d. Photographs before and after test.

4.5.17 Velocity. The test shall be conducted in accordance with Appendix E.

4.6 Defect penalty. In any ballistic test, except function and casualty, in which the occurrence of a firing defect listed in Table III prevents the obtaining of a reliable result for the characteristic being tested, an additional round shall be fired. That particular test shall not be penalized, but the total ballistic sample shall be penalized for such defects in accordance with Table III.

4.7 Test validity. If for any reason the test site considers that the test conditions have detrimentally affected the test results, the test shall be declared invalid and a new test shall be performed with additional samples.

5. PACKAGING

5.1 Unit pack. Fifty (50) M939 cartridges shall be packed in accordance with dwg. 12913962.

5.2 Packaging. Twenty (20) unit packs shall be packaged in an M2A1 metal ammunition container in accordance with dwg. 12913960.

5.3 Packing. Two (2) M2A1 containers shall be packed in accordance with dwg. 12913959.

5.4 Marking. The unit pack, packaging and packing shall be marked in accordance with dwg. 12913962, 12913960 and 12913959, respectively.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The cartridge covered by this specification is intended for use in the M287 Sub-Caliber Trainer for the AT4.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Issue of DODISS to be cited in the solicitation, and, if required, the specific issue of individual documents referenced (see 2.1.1).
- b. Responsibility for furnishing ammunition and Government property.
- c. Title, number and date of this specification.
- d. Requirements for submission of trajectory qualification sample.
- e. Requirements for submission of first article sample.

6.3 Submission of contractor inspection equipment designs for approval. Submit copies of designs as required to: Commander, U.S. Army ARDEC, ATTN: SMCAR-QAF-S, Picatinny Arsenal, NJ 07806-5000. This address will be specified on the Contract Data Requirements List, DD Form 1423 in the contract.

6.4 Material safety data sheets. Contracting officers will identify those activities requiring copies of completed Material Safety Data Sheets prepared in accordance with FED-STD-313. The pertinent Government mailing address for submission of data are listed in FED-STD-313 and below:

Commander
U.S. Army Armament, Munitions
and Chemical Command
ATTN: AMSMC-SFP
AMSMC-TMP-P
AMSMC-PC
AMPMS-AR-ESK
Rock Island, IL 61299-6000

6.5 Explosive sensitivity data. Results of explosive sensitivity testing (see 3.5.5) shall be submitted to Commander, U.S. Army ARDEC, ATTN: SMCAR-SF, Picatinny Arsenal, NJ 07806-5000.

6.6 Final hazard classification. The ARDEC Safety Office shall be notified two weeks prior to the start of hazard classification testing. The results of hazard classification testing shall be provided to Commander, U.S. Army ARDEC, ATTN: SMCAR-SF, Picatinny Arsenal, NJ 07806-5000.

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6.7 Attributes sampling inspection. Unless otherwise specified in the contract, the contractor may inspect for those characteristics designated as "ASI" in the Classification of Characteristics paragraphs by using sampling procedures in accordance with MIL-STD-105. Sampling for minor defects should utilize plans indexed by an AQL of 1.5 percent or less (tighter). Sampling for major characteristics should utilize plans indexed by an AQL of 0.25 percent or less (tighter). The AQL is simply an index to the sampling tables in the standard and the designation of an AQL does not imply that the contractor has the right to knowingly supply any defective unit of product. All sampling procedures must be specifically detailed and incorporated into the contractor's quality program plan or detailed inspection system.

6.8 Trajectory samples. Sample cartridges for trajectory testing shall be submitted to Commander, U.S. Army ARDEC, ATTN: SMCAR-CCL-SD, Picatinny Arsenal, New Jersey 07806-5000.

6.9 Hazard notice. The cartridges described herein and some of its components are flammable and explosive and consequently present hazards in manufacture, handling, storage and shipment. The contractor should recognize these hazards and take appropriate measures to prevent fire, explosion, adverse environment, rough handling, corrosive atmosphere and electrically induced incidents. Such measures shall include the employment of an effective safety program that addresses the inherent hazards associated with the cartridge.

6.10 Drawings. Drawings listed in Section 2 of this specification under the heading U.S. Army Armament, Research, Development and Engineering Center (ARDEC) may also include drawings prepared by, and identified as U.S. Army Armament, Research and Development Command (ARRADCOM), Frankford Arsenal, Rock Island Arsenal or Picatinny Arsenal drawings. Technical data originally prepared by these activities is now under cognizance of ARDEC.

6.11 Subject term (key word) listing.

- Bullet
- Small Caliber Ammunition
- Trajectory Testing
- Velocity Testing

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6.12 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodian:
Army-AR

Preparing activity:
Army-AR

(Project 1305-AE68)

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APPENDIX A

RESIDUAL STRESS TEST PROCEDURE

10.0 SCOPE

10.1 Scope. This residual stress test is performed to determine if the residual stress in polyethylene cases is great enough to cause splits or cracks in service or during long term storage.

20.0 APPLICABLE DOCUMENTS

This section is not applicable to this appendix.

30.1 Equipment. Equipment used in this test shall be approved by the Government prior to testing (see 6.3).

30.2 Detergent. Detergent, Nonylphenoxy Poly, (Ethyleneoxy) Ethanol is required for this test.

30.3 Samples. Test samples shall consist of complete sets of the quantity of parts specified with the exception of propellant and primer (insert cartridge). Process the components on the production line and assemble to meet all final assembly dimensional requirements.

40.0 TEST PROCEDURES

40.1 Immersion. Immerse the test samples in the detergent. Seal the detergent coated samples in a polyethylene bag to minimize evaporation and place them in an aluminum tray. Place the tray with the sealed bags of test samples in an oven set at $160^{\circ}\text{F} \pm 5^{\circ}\text{F}$ for seven (7) days.

40.2 Soak. After seven (7) days, remove the tray from the oven and cool for one hour. Rinse the insert test samples in running water to remove the detergent. Dry with clean rags or paper towels. Coat the surfaces with machinist's dye and wipe with rags or towels, removing all excess dye from the surfaces.

40.3 Examination. Examine the surfaces for cracks, splits and crazing using a 7-power eye loop or magnifying glass.

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50.0 RECORDING OF DATA

50.1 Data. Record the following:

- a. Date of test.
- b. Test ammunition lot number and specification number.
- c. Cracks - Number, size and location (Dwg. 7643674).
- d. Splits - Number, size and location (Dwg. 7643674).
- e. Crazing - Number, size and location (Dwg. 7643674).
- f. Technician.
- g. Foreman.

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APPENDIX B

DISPERSION TEST PROCEDURE

10.0 SCOPE

10.1 Scope. The dispersion test is fired under controlled conditions at a target located at a specified distance from the weapon to determine the dispersion of bullets.

10.2 Concurrent testing. Test conditions for the "Velocity for trajectory control" test (if performed concurrently) shall apply.

20.0 APPLICABLE DOCUMENTS

This section is not applicable to this appendix.

30.0 EQUIPMENT

30.1 Equipment. Equipment listed in the applicable Inspection Equipment List shall be used (see 6.3).

30.2 Target. The target for Accuracy Tests shall not be less than 36 inches x 36 inches. A windup motor operated by remote control may be used for changing to a new target.

30.3 Mount. In order to minimize weapon inaccuracies, the mount on which the test assembly is mounted, shall be of solid construction.

40.0 PREPARATION

40.1 Wind velocity. The flight of the bullet is affected to a degree by the direction and velocity of the wind over the outdoor range. Therefore, accuracy tests should not be fired when the velocity of the transverse wind is greater than 8 miles per hour, or varying by more than 4 miles per hour.

40.2 Weapon. The M287 Sub-Caliber Trainer shall be used for dispersion testing.

40.3 Test mount. The accuracy test weapon is assembled and clamped in position on the mount and boresighted into position. It is of prime importance that the assembly be mounted properly so that the weapon maintains its original position from shot to shot.

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40.4 Test cartridges. The test cartridges shall be placed at a point convenient to the technician. It is not necessary to condition the ammunition at a specified temperature prior to firing, but it is necessary that all cartridges be uniform with respect to temperature.

40.5 Weapon/targets. The number of test rounds to be fired shall be divided equally among the barrels.

50.0 CONDUCTING THE TEST

50.1 Warmers. A sufficient number of unrecorded cartridges of the type of ammunition under test shall be fired to assure that the test weapon is correctly sighted on the target, but in any event a minimum of 5 cartridges shall be fired to warm and foul the weapon when it is first put into service and after it has been cleaned or cooled. The approximate location of the shots fired is reported to the technician in order that alignment of the weapon may be adjusted, if necessary.

50.2 Targets. After the warming (fouling) cartridges have been fired, the target shall be changed so as to present a fresh surface for the succeeding target. Thereafter, the target shall be changed after each target of 10 cartridges has been fired.

50.3 Firing rate. Consideration is not given to the position of the propellant in the cartridge case, except that the manner of handling the ammunition from cartridge to cartridge is reasonably uniform. Ten cartridges shall then be fired in even sequence at a rhythmic uniform rate, as rapidly as service of the weapon permits.

50.4 Test barrel. The procedure prescribed in 40.3 shall then be repeated until the specified number of targets has been fired in each trainer. At no time should the exposed metal surface of the test barrel become too hot to grasp with the bare hands.

60.0 ANALYSIS OF TARGET

60.1 Measurement of the target. The vertical reference axis and horizontal reference axis for each target is drawn onto the target. A vertical line drawn through the center of the left-most shot hole represents the vertical reference axis. A horizontal line drawn through the center of the bottom-most shot hole represents the horizontal reference axis. For each target, the vertical distance from the horizontal reference axis to each shot hole is measured, recorded and used in calculating the

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vertical standard deviation for that target. For each target, the horizontal distances from the vertical reference axis to each shot hole is measured, recorded and used in calculating the horizontal standard deviation for that target. The shot holes should be numbered and the measurements taken in sequence to avoid confusion.

60.2 Calculation. From these measurements, the vertical and horizontal standard deviations from each group of shots are calculated using the following formula:

$$\text{Standard Deviation} = \sqrt{\frac{n(\sum d^2) - (\sum d)^2}{n(n-1)}}$$

Where n = the number of shot holes
d = distance from reference axis

60.3 Target misses. Should a target not contain 10 shot holes, proper alignment of the weapon shall be verified by calculating the location of the center of impact of the shot holes on the target. The target shall be considered invalid (and must be refired) if the center of impact is too near the edge of the target (13 inches or less from the nearest edge of the target). Otherwise, the target is valid and the missing shot holes shall be counted as defects against the lot, in accordance with the specification.

70.0 RECORDING OF RESULTS

70.1 Test results. All test results shall be recorded to the nearest one-tenth of an inch.

70.2 Test sheets. Test sheets shall show the following:

- a. Vertical standard deviation.
- b. Horizontal standard deviation.
- c. Velocity and direction of wind.
- d. ALL FUNCTION AND CASUALTY DEFECTS.
- e. Failures to trace.

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80.0 FACTORS AFFECTING ACCURACY TESTS

80.1 External factors. The external factors should be controlled as closely as possible in order to obtain results that are representative of the inherent accuracy of the ammunition.

80.2 Test weapon. The dimensions and condition of accuracy weapons, as well as the manner of placing the weapon in the rest, are of prime importance.

80.3 Handling. The technique of test can affect accuracy results. If uniformity in the manner in which the cartridges are handled, chambered and fired is poor, a larger spread is obtained than if the cartridges are tested in a uniform manner.

80.4 Barrel temperature. The temperature of the test barrel should be controlled.

80.5 Atmospheric conditions. The atmospheric conditions existing at the time the test is fired can influence the test results.

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APPENDIX C

TRACE TEST PROCEDURE

10.0 PURPOSE

10.1 Purpose. To determine the relative effectiveness of tracer ammunition to disclose the path of bullet flight by firing it under controlled conditions, and determine thereby the acceptance or rejection based on the criteria specified in the applicable specification.

20.0 APPLICABLE DOCUMENTS

This section is not applicable to this appendix.

30.0 EQUIPMENT

30.1 Equipment. Equipment used in this test shall be approved by the Government prior to testing (see 6.3).

30.2 Firing range. Firing range shall be of sufficient length to permit firing of cartridges in accordance with this specification.

40.0 OBSERVATION POINTS

40.1 Observation for night testing. Observation of trace performance during night testing shall be made at the training weapon and at points 65 meters and 450 meters beyond the muzzle of the trainer on a line parallel to and approximately 70 meters from the plane of the trajectory. Lights or other suitable visible markers shall be placed opposite the 65 meters and 450 meters observation points to insure a line of sight from each point perpendicular to the plane of the trajectory.

40.2 Observation at the trainer. The observer at this point shall observe for any abnormal behavior as an informational check only. Record shall be made of erratic flight, bursting bullets, muzzle flash of obviously greater intensity than that produced by other bullets in the sample, or such other behavior as many be considered abnormal by the observer.

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40.3 Observation at 65 meter position. The observer, with line of sight established perpendicular to the trajectory by the light or the visible marker, shall note the trace performance of the bullet from each sample cartridge. A trace which is visible at 65 meters shall be considered acceptable. The cartridge shall be considered defective if trace is not visible at 65 meters.

40.4 Observation at 450 meter position. The observer, with line of sight established perpendicular to the trajectory by the light or the visible marker, shall note the trace performance of the bullet from each sample cartridge. A trace which is visible at 450 meters shall be considered acceptable. The cartridge shall be considered defective if trace is not visible at 450 meters.

40.5 Observation for day testing. Observation of trace performance during day testing shall be made from directly behind the trainer only.

50.0 TEST PROCEDURES

50.1 Preparation for firing.

50.1.1 Trace test. Trace test shall be conducted in accordance with the requirements contained herein and in this specification. One half of the sample cartridges shall be tested at night. The remaining cartridges shall be tested during the day.

50.1.2 Test weapon. All trace testing shall be performed in the M287 Sub-Caliber training weapon. The trainer shall be at ambient temperature prior to firing each test.

50.1.3 Test mount. The Trainer System is assembled in the fixture on the mount. The pier or mount shall be of solid construction.

50.1.4 Firing sequence. Since temperature conditioning of the ammunition is not necessary, the ammunition shall be fired under existing conditions; however, to prevent the temperature of the weapon from affecting cartridge performance, the cartridges shall be fired in a uniform sequence.

50.2 Firing the test.

50.2.1 Warmers. Three unrecorded cartridges shall be fired to sight and warm the weapon prior to each test.

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50.2.2 Firing sequence. The cartridge shall be fired in a uniform sequence, with sufficient interval between cartridges to allow the trace of each individual shot to be observed and recorded by each observer.

60.0 RECORDING THE DATA

60.1 Trace characteristics. The trace characteristic of each shot fired are recorded as it passes each observation point. After the test is completed, the observer must check their respective observations together, shot by shot. Defects reported at more than one point for the same shot shall be recorded as one failure.

60.2 Record the following:

- a. Date of test.
- b. Test ammunition lot number and specification number.
- c. Number of cartridges fired.
- d. Satisfactory trace (percentage).
- e. Number and type of defects.
- f. Number and type of case casualties.
- g. Technician.
- h. Foreman.

60.3 Weapon test data. The following test weapon data shall be recorded on the test sheet.

- a. Receiver number.
- b. Barrel number.
- c. Total number of cartridges fired in barrel prior to test.

APPENDIX D

NOISE LEVEL TEST PROCEDURE

10.0 PURPOSE

10.1 Purpose. To compare the noise level of cartridges at the gunner's head position.

20.0 APPLICABLE DOCUMENTS

This section is not applicable to this appendix.

30.0 EQUIPMENT

30.1 Equipment. Equipment used in this test shall be approved by the Government (see 6.3) prior to testing.

30.2 M287 Trainer.

40.0 TEST PROCEDURES

40.1 Pre-firing (preparation for test).

40.1.1 Temperature conditioning. Test cartridges shall be conditioned at $70 \pm 2^{\circ}\text{F}$ for a minimum of four hours.

40.1.2 Trainer. The trainer shall be assembled in the test fixture on the mount.

40.1.3 Noise level measurement. A noise level measurement device shall be positioned such that the noise level is measured at the right handed gunner's head position and at a point 1 meter to the right of the trainer.

40.2 During firing.

40.2.1 Observer. An observer is stationed at the noise level meter.

40.2.2 Firing. The test cartridges shall be loaded into the trainer and fired. One half of the sample rounds shall be fired for noise level measurement at each of the specified positions.

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40.2.3 Noise levels. The noise levels are recorded.

40.2.4 Case examinations. Fired cases shall be visually examined by the technician for possible case casualties.

50.0 RECORDING OF DATA

50.1 Data. Record the following:

- a. Date of test.
- b. Test ammunition lot number and specification number.
- c. Ammunition temperature.
- d. Gun room temperature.
- e. Firing range temperature.
- f. Outdoor temperature.
- g. Gun type and serial number.
- h. Number of times the barrel has been fired.
- i. Gun headspace.
- j. Firing pin protrusion.
- k. Firing pin indent.
- l. Case casualties.
- m. Any abnormality.
- n. Gunner.
- o. Foreman.
- p. Location of microphones.

50.2 Computations. Calculate the difference in noise levels between the cartridge and the requirement.

50.3 Results. Show all the information on the data sheets plus the calculated noise level difference.

APPENDIX E

M287 TRAINER VELOCITY TEST PROCEDURE

10.0 SCOPE

10.1 Scope. This velocity test determines if the lot under test complies with the design velocity requirement. Conformance to the design velocity requirement infers compliance with the trajectory requirement.

20.0 APPLICABLE DOCUMENTS

This section is not applicable to this appendix.

30.0 EQUIPMENT

30.1 Equipment. Equipment used in this test shall be approved by the Government prior to testing (see 6.3).

30.2 Mount. In order to minimize weapon inaccuracies, the mount on which the test assembly is mounted, shall be of solid construction.

40.0 USE OF REFERENCE CARTRIDGES

40.1 Reference cartridges shall be used to establish range and equipment corrections prior to firing any ammunition lot for acceptance.

40.2 After twenty (20) reference cartridges have been fired in the weapon to be used for the test, the observed mean velocity of the reference cartridges shall be compared with the assessed values. If the assessed value is higher, the difference is a plus correction and shall be added to the mean velocity of the test cartridges. If the assessed value is lower, the difference is a minus correction and shall be subtracted from the mean velocity of the test cartridges. If both values are identical, no correction is applied.

40.3 Charts shall be maintained of the results obtained with each weapon barrel using reference cartridges.

40.4 The weapon barrel shall be withdrawn from service when the performance variations exceed the assessed value of the reference cartridge by more than ± 50 ft/s.

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40.5 It is to be noted that weapon barrels shall be retested several times before finally rejected as out of tolerance.

50.0 PREPARATION

50.1 The required number of reference cartridges and test cartridges shall be placed in a vertical position, primer end down, in separate recessed holding blocks. Each sample, properly identified, shall be placed in a constant temperature box or room, and shall be conditioned for a minimum of two hours.

50.2 The M287 Sub-Caliber Trainer shall be used for the Weapon Velocity Test.

50.3 The firing range shall be set up as shown in DOD-STD-1468, Section 4, Drawing Number 1. Velocity Screens shall be checked for position. The instrumental point (mid-point between screens) shall be 16 meters from the muzzle.

50.4 The chamber and bore of the barrel shall be wiped dry and barrel bore sighted into position.

60.0 CONDUCTING THE TEST

60.1 Five fouling shots shall be fired. The velocity readings shall be recorded to assure that the measuring equipment is functioning properly.

60.2 When firing at 21°C, the recessed holding blocks containing the reference and test cartridges shall be removed from the controlled-temperature room or box and placed at a point convenient to the technician, provided the temperature of the firing room is approximately 21°C. If the firing room is not at approximately 21°C the cartridges shall be placed in an insulated box (five cartridges at a time) and placed at a point convenient to the technician. The cartridges shall then be removed singly from the insulated box immediately before firing. If an insulated box is not available, the cartridges shall be removed singly from the temperature-controlled room or box immediately before firing.

60.3 In order that the propellant shall be uniformly positioned from shot to shot, attention to detail is necessary in handling and chambering the cartridge. The cartridge shall first be held vertically, bullet upward. It shall then be rotated slowly in a vertical plane, stopping the rotation momentarily after 180 degrees of rotation when the bullet is downward, and

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then continuing through the remainder of 360 degrees, stopping with the cartridge again bullet end upward. The bullet end of the cartridge shall now be lowered slowly to a position slightly above horizontal.

60.4 The cartridge shall be chambered very carefully, taking care that the primer end of the case is not elevated above the bullet end of the case. (The object is to have the propellant in a loose condition at the primer end of the case, and with such airspace as is present, at the bullet end of the case.)

60.5 The breech shall be closed gently. If the technician encounters any difficulty closing the breech the test shall be discontinued until such difficulty is corrected. If any delay occurs after the cartridge is placed in the chamber, and duration of the delay is such that the temperature of the cartridge has changed significantly, the cartridge shall be extracted and another inserted in its place.

60.6 The technician fires the weapon from a safe position. The velocity shall be recorded, the breech opened, the case extracted and visually examined for case casualties.

60.7 The procedure prescribed in 60.3 through 60.6 is repeated until the required number of reference cartridges have been fired.

60.8 The velocity correction shall then be obtained as prescribed in paragraph 40.2.

60.9 Provided the requirements of paragraph 40.4 are met, the procedure in paragraph 60.3 through 60.6 is repeated with test cartridges until the required number have been fired.

70.0 RECORDING THE RESULTS

70.1 Results of both reference and test cartridges should be recorded directly on the test sheet form. Average velocity and velocity standard deviation shall be recorded to the nearest ft/s. The pooled standard deviation for the three test barrels combined shall be calculated as the square root of the average of the variances (the variance is the square of the standard deviation) obtained in the individual test barrels.

70.2 All groups of data will be tabulated to show means, extreme variations and standard deviation of each group, and the number and type of case casualties.

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70.3 The following test weapon data shall be recorded on the test sheet:

- a. Weapon number.
- b. Barrel number.
- c. Total number of cartridges fired in barrel (prior to test).

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
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I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER

MIL-C-70845A (AR)

2. DOCUMENT DATE (YYMMDD)

940816

3. DOCUMENT TITLE

CARTRIDGE, 9MM, PRACTICE, TRACER, M939

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets if needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle Initial)

b. ORGANIZATION

c. ADDRESS (Include Zip Code)

d. TELEPHONE (Include Area Code)

7. DATE SUBMITTED

(1) Commercial
(2) AUTOVON
(If applicable)

(YYMMDD)

8. PREPARING ACTIVITY

a. NAME

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STANDARDIZATION OFFICE

b. TELEPHONE (Include Area Code)

(1) Commercial
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